

Application No.: 10/664,017

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**REMARKS**

Claims 1, 2, 4-10, 12, 15-39 are now in the application. Claims 1, 2, 4-10, 15-18 and 20-21 are directed to the elected invention. Claims 19 and 22-39 are directed to non-elected inventions and may be canceled by the Examiner upon the allowance of the claims directed to the elected invention. Claim 1 has been amended to recite "at least one peroxide compound selected from the group consisting of hydrogen peroxide, a peroxy carboxylate, perborate, and percarbonate, and mixtures thereof" from claims 2 and 3. Claim 1 has been amended to recite that the weak complexant is "selected from the group consisting of ammonia and an amine" and that the strong complexant is "selected from the group consisting of an aminocarboxylate and an aminophosphonate" from claim 2. Claim 1 has also been amended to recite that the etching composition "further comprising a non-oxidizing acid or salt thereof or a base" from prior 11. Claim 1 has further been amended by "2" for purposes of clarification and not to limit its scope.

In view of these amendments, claims 3, 11, 13 and 14 have been canceled without prejudice to their reentry at some later date. Claim 4 has been amended to depend from claim 2 rather than now canceled claim 3 and Claim 12 has been amended to depend from claim 1 rather than now canceled claim 11 for purposes of clarification and not to limit their scope. Claim 7 has been amended to recite "weak" for purposes of clarification and not to limit its scope.

The amendments to the claims do not introduce any new matter.

The rejection to claims 7-8 under 35 U.S.C. 112 has been obviated by the amendment to claim 7.

The rejections of Claims 1-8 under 35 U.S.C. 102(e) as being anticipated by or under 35 U.S.C. 103(a) as being obvious over U.S. Patent 6,537,381 to Mikhaylich and of Claims 1, 2, 5-

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8, 11-18, 20 and 21 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 3,809,588 to Zeblicky in view of U.S. Patent 6,787,480 to Aoki have been rendered moot by the above amendments to claim 1 that includes recitations from both claims 3 and 10.

Claims 1-8 and 11-18 and 20-21 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 4,349,411 to Okinaka in view of U.S. Patent 6,787,480 to Aoki. The cited references do not render obvious the present claims. In particular, Okinaka fails to even remotely suggest the use of a combination of complexants as recited in the present. Moreover, Okinaka does not even discuss the advantages achievable by the present invention as discussed in the specification. In particular, as discussed in the specification at page 6, lines 3-10, the use of a combination of both the weak complexant and strong complexant makes possible a relatively steady state regime of continuous inhibiting formation and dissolution. It is believed that the presence of the strong complexant insures a continuous slow dissolution of the inhibiting layer, which in turn makes it possible to avoid a multiple etching step process for dissolving the inhibiting layer and then contacting the structure again with the etchant. The etching process of this invention can be carried out in a single etching step. On the other hand, the use of only a strong complexant, the inhibiting layer would not be adequately formed and the etching would tend to be less uniform.

It is believed that the inhibiting or etch control layer formed *in situ* is typically a hydrated copper oxide. The inhibiting layer formation then limits the diffusion of the oxidant towards the copper metal surface, and the diffusion of the copper ionic species away from the metal surface to govern the overall reaction rate. By creating this inhibiting layer the surface layer the copper or copper alloy can be selectively removed thus resulting in a very uniform etching. The copper-complexing components of the solution attack the exposed surface of the inhibiting layer and remove it at a rate which depends on their concentrations. The thickness of the inhibiting layer, and the etch rate, can be controlled by modifying the concentrations of the oxidant and the complexants, as well as the temperature.

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Unlike passivation layers, such as the well known ones formed by benzotriazole (BTA), the inhibiting layer, according to the present invention, does not prevent oxidation of the metal. Instead, it modulates the oxidation process by allowing substantial diffusion of etchant toward the copper surface. Since the reaction of the oxidant with copper is very fast, the overall etching rate is controlled by diffusion of reactants and possibly reaction products through the inhibiting layer, which at a given time is of about the same thickness everywhere irrespective of copper feature size.

At the same time, electrochemical reactions of the galvanic corrosion type, which in state-of-the-art etchants etch the most active metallic copper areas (e.g., small features) selectively, are suppressed. Since diffusion through the inhibiting layer is much slower than in the liquid, effects of local hydrodynamic variations are also lessened.

A person skilled in the art would not be lead by Okinaka to employ the complexant combination and expect with any reasonable degree of predictability that the results achievable by the present invention could be obtained.

Aoki does not overcome the above discussed deficiencies of Okinaka with respect to rendering obvious the above claims. Aoki was merely relied upon for a disclosure of removing copper oxide.

The mere fact that cited art may be modified in the manner suggested in the Office Action does not make this modification obvious, unless the cited art suggest the desirability of the modification. No such suggestion appears in the cited art in this matter. The Examiner's attention is kindly directed to *In re Lee* 61 USPQ2d 1430 (Fed. Cir. 2002) *In re Dembiczak et al.* 50 USPQ2d. 1614 (Fed. Cir. 1999), *In re Gordon*, 221 USPQ 1125 (Fed. Cir. 1984), *In re Laskowski*, 10 USPQ2d. 1397 (Fed. Cir. 1989) and *In re Fritch*, 23, USPQ2d. 1780 (Fed. Cir. 1992).

In *Dembiczak et al.*, *supra*, the Court at 1617 stated: "Our case law makes clear that the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis

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is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references. See, e.g., C.R. Bard, Inc., v. M3 Sys., Inc., 157 F.3d. 1340, 1352, 48 USPQ2d. 1225, 1232 (Fed. Cir. 1998) (describing 'teaching or suggestion motivation [to combine]' as in 'essential evidentiary component of an obviousness holding'), In re Rouffet, 149 F.3d 1350, 1359, 47 USPQ2d. 1453, 1459 (Fed. Cir. 1998) ('the Board must identify specifically...the reasons one of ordinary skill in the art would have been motivated to select the references and combine them');...".

Also, the cited art lacks the necessary direction or incentive to those of ordinary skill in the art to render the rejection under 35 USC 103 sustainable. The cited art fails to provide the degree of predictability of success of achieving the properties attainable by the present invention needed to sustain a rejection under 35 USC 103. See *Diversitech Corp. v. Century Steps, Inc.* 7 USPQ2d 1315 (Fed. Cir. 1988), *In re Mercier*, 185 USPQ 774 (CCPA 1975) and *In re Naylor*, 152 USPQ 106 (CCPA 1966).

Moreover, the properties of the subject matter and improvements which are inherent in the claimed subject matter and disclosed in the specification are to be considered when evaluating the question of obviousness under 35 USC 103. See *Gillette Co. v. S.C. Johnson & Son, Inc.*, 16 USPQ2d. 1923 (Fed. Cir. 1990), *In re Antonie*, 195, USPQ 6 (CCPA 1977), *In re Estes*, 164 USPQ 519 (CCPA 1970), and *In re Papesch*, 137 USPQ 43 (CCPA 1963).

No property can be ignored in determining patentability and comparing the claimed invention to the cited art. Along these lines, see *In re Papesch*, supra, *In re Burt et al*, 148 USPQ 548 (CCPA 1966), *In re Ward*, 141 USPQ 227 (CCPA 1964), and *In re Cescon*, 177 USPQ 264 (CCPA 1973).

In view of the above, reconsideration and allowance are, therefore, respectively solicited. In the event that the Examiner believes an interview might serve to advance the prosecution of this application in any way, the undersigned attorney is available at the telephone number noted below.

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Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 22-0185 under Order No. 20140-00297-US from which the undersigned is authorized to draw.

Dated: 10-12-05

Respectfully submitted,

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